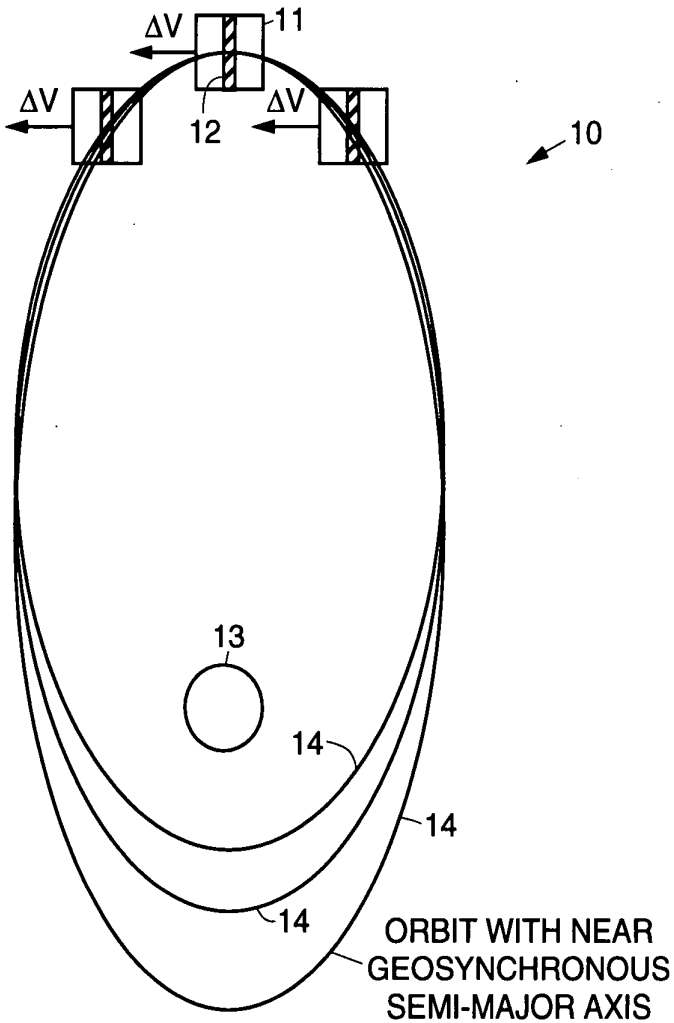


Fig. 1
(PRIOR ART)

Fig. 2
(PRIOR ART)

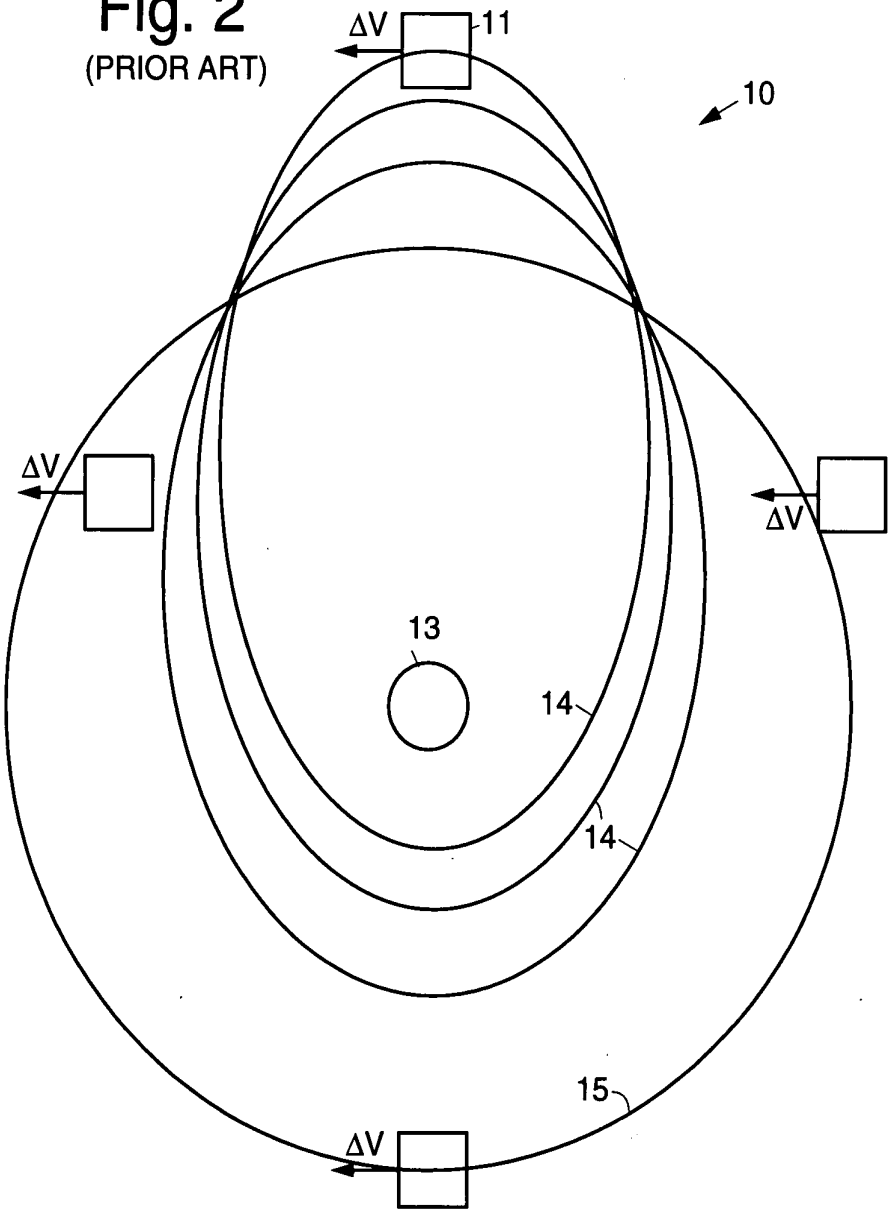


Fig. 3

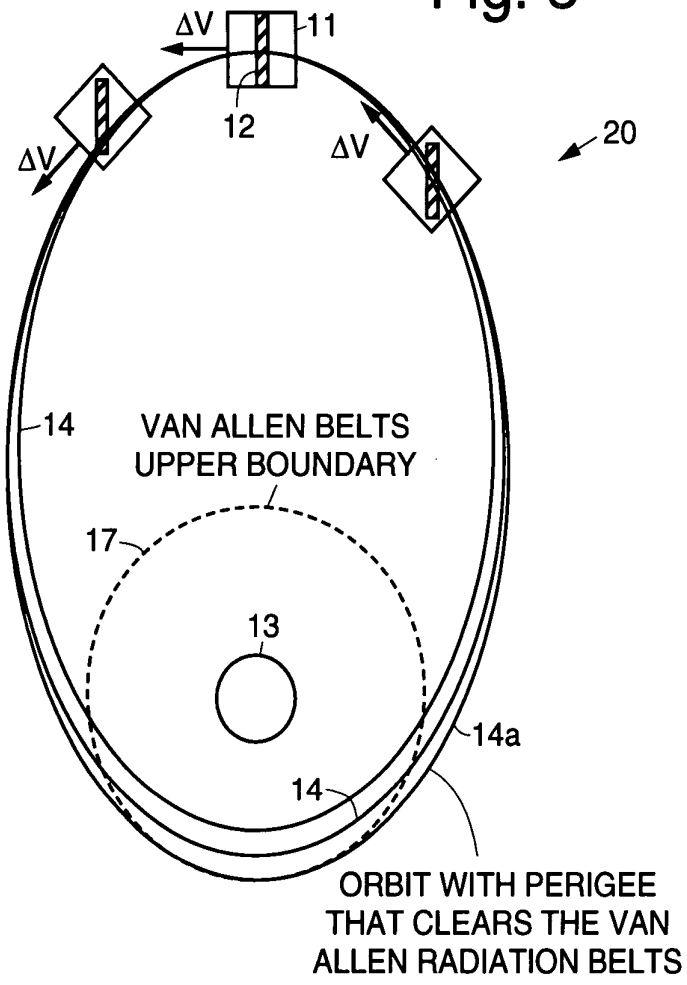

ΔV
11
12
ΔV
ΔV
20
14
VAN ALLEN BELTS
UPPER BOUNDARY
17
13
14a
14
ORBIT WITH PERIGEE
THAT CLEARS THE VAN
ALLEN RADIATION BELTS

Fig. 4

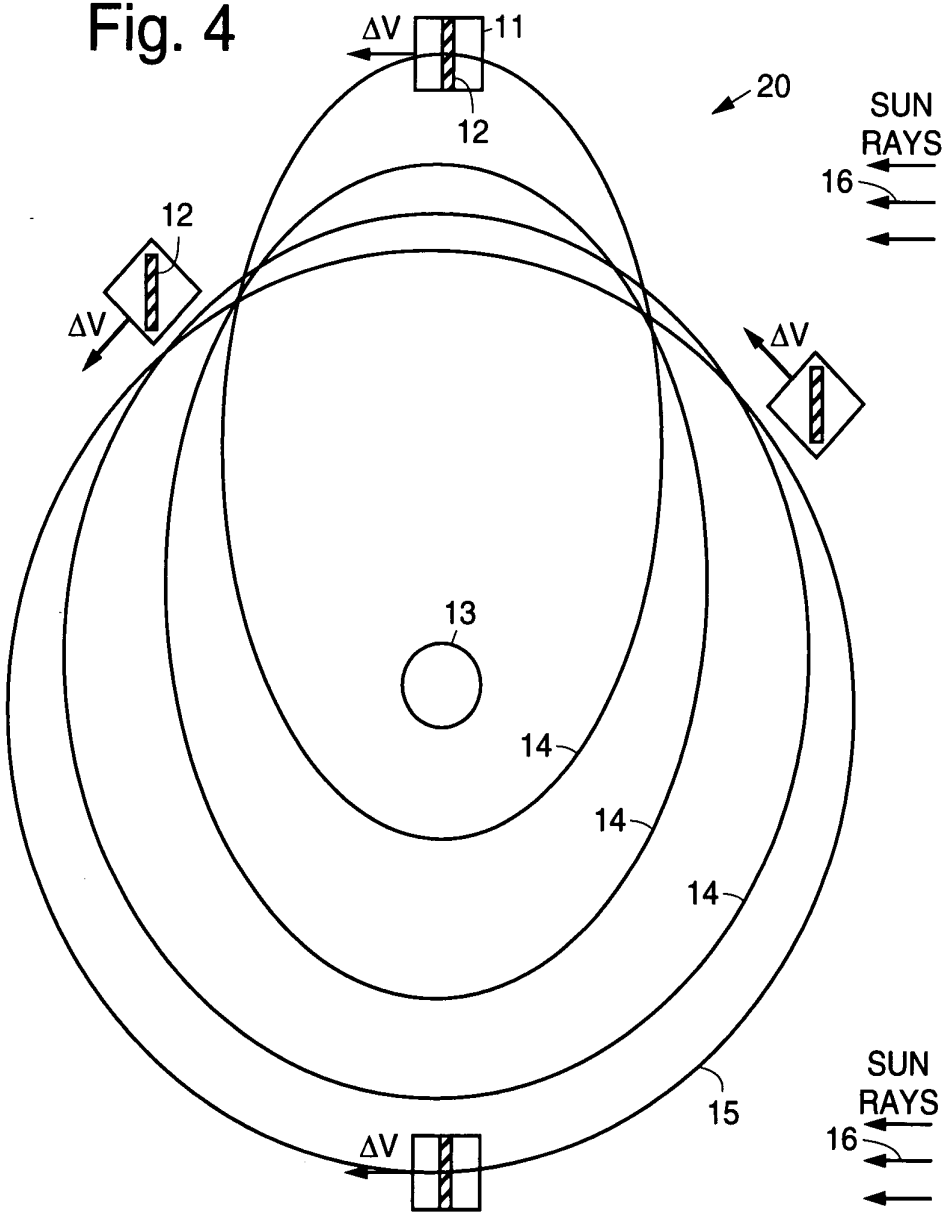

ΔV
11
12
20
SUN
RAYS
16
12
ΔV
ΔV
13
14
14
14
15
ΔV
SUN
RAYS
16

Fig. 5

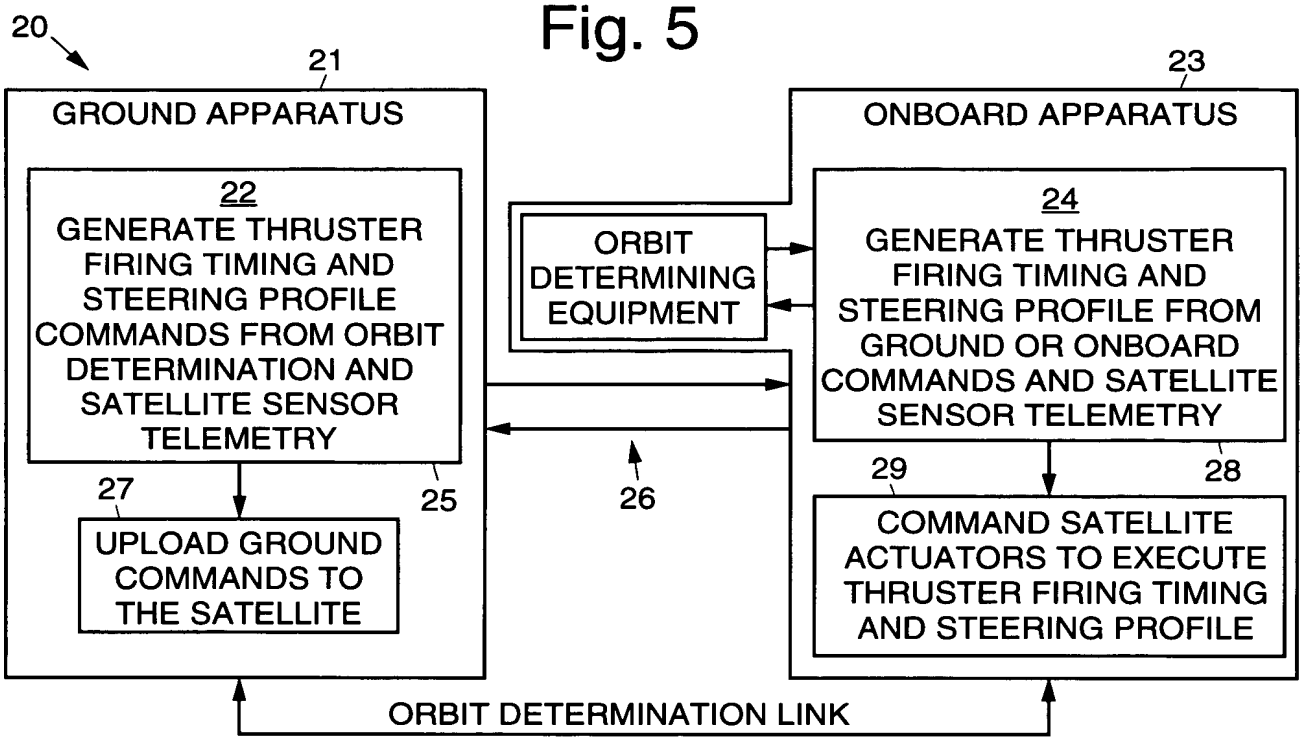

20
21
GROUND APPARATUS
22
GENERATE THRUSTER FIRING TIMING AND STEERING PROFILE COMMANDS FROM ORBIT DETERMINATION AND SATELLITE SENSOR TELEMETRY
27
25
UPLOAD GROUND COMMANDS TO THE SATELLITE
ORBIT DETERMINING EQUIPMENT
26
23
ONBOARD APPARATUS
24
GENERATE THRUSTER FIRING TIMING AND STEERING PROFILE FROM GROUND OR ONBOARD COMMANDS AND SATELLITE SENSOR TELEMETRY
29
28
COMMAND SATELLITE ACTUATORS TO EXECUTE THRUSTER FIRING TIMING AND STEERING PROFILE
ORBIT DETERMINATION LINK

Fig. 6

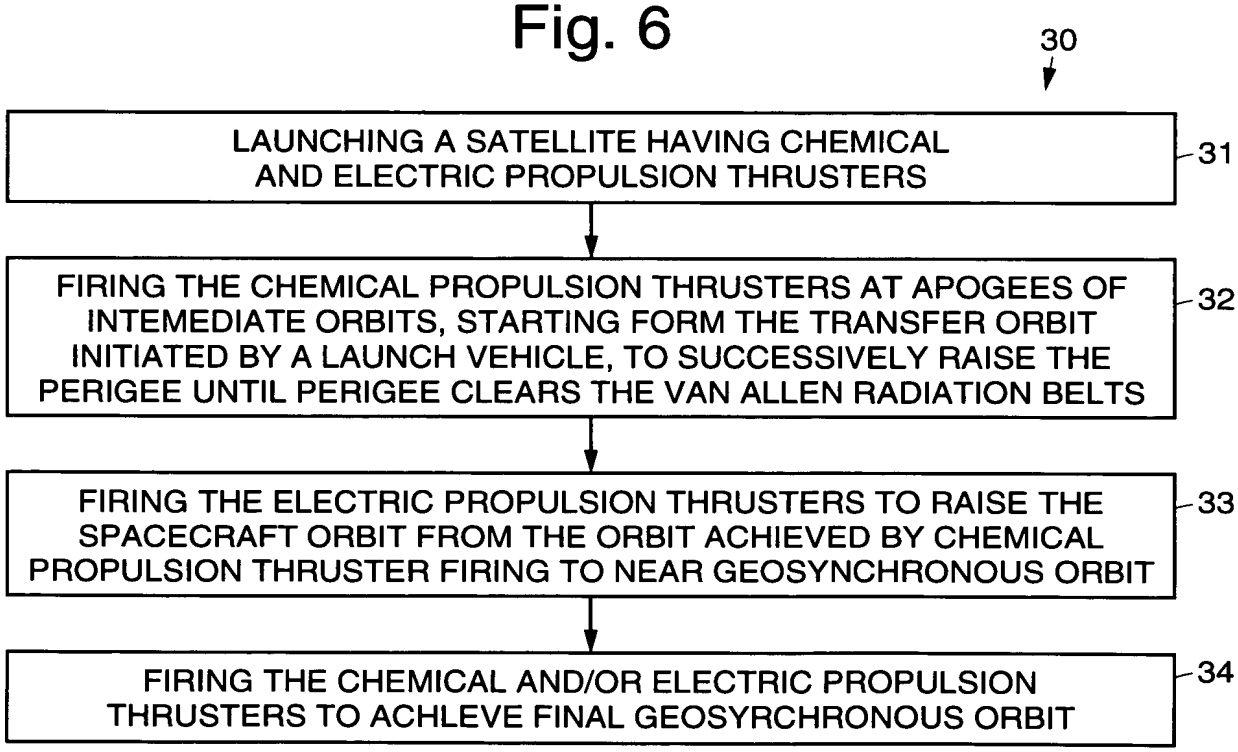

30
LAUNCHING A SATELLITE HAVING CHEMICAL AND ELECTRIC PROPULSION THRUSTERS
31
FIRING THE CHEMICAL PROPULSION THRUSTERS AT APOGEES OF INTEMEDIATE ORBITS, STARTING FORM THE TRANSFER ORBIT INITIATED BY A LAUNCH VEHICLE, TO SUCCESSIVELY RAISE THE PERIGEE UNTIL PERIGEE CLEARS THE VAN ALLEN RADIATION BELTS
32
FIRING THE ELECTRIC PROPULSION THRUSTERS TO RAISE THE SPACECRAFT ORBIT FROM THE ORBIT ACHIEVED BY CHEMICAL PROPULSION THRUSTER FIRING TO NEAR GEOSYNCHRONOUS ORBIT
33
FIRING THE CHEMICAL AND/OR ELECTRIC PROPULSION THRUSTERS TO ACHLEVE FINAL GEOSYRCHRONOUS ORBIT
34

Fig. 7

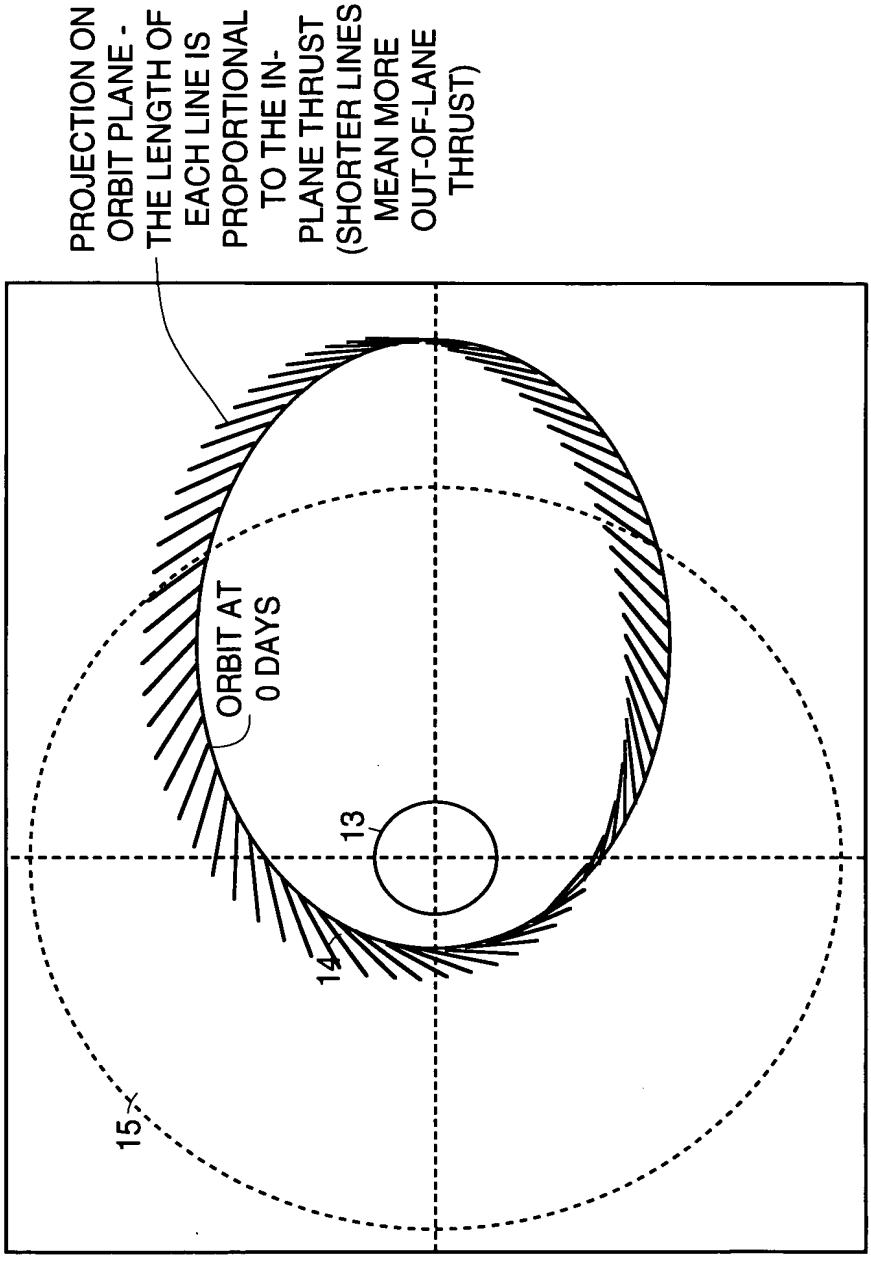

PROJECTION ON ORBIT PLANE - THE LENGTH OF EACH LINE IS PROPORTIONAL TO THE IN-PLANE THRUST (SHORTER LINES MEAN MORE OUT-OF-LANE THRUST)
ORBIT AT 0 DAYS
13
14
15

Fig. 8

TYPICAL IN-PLANE THRUSTING PROFILE

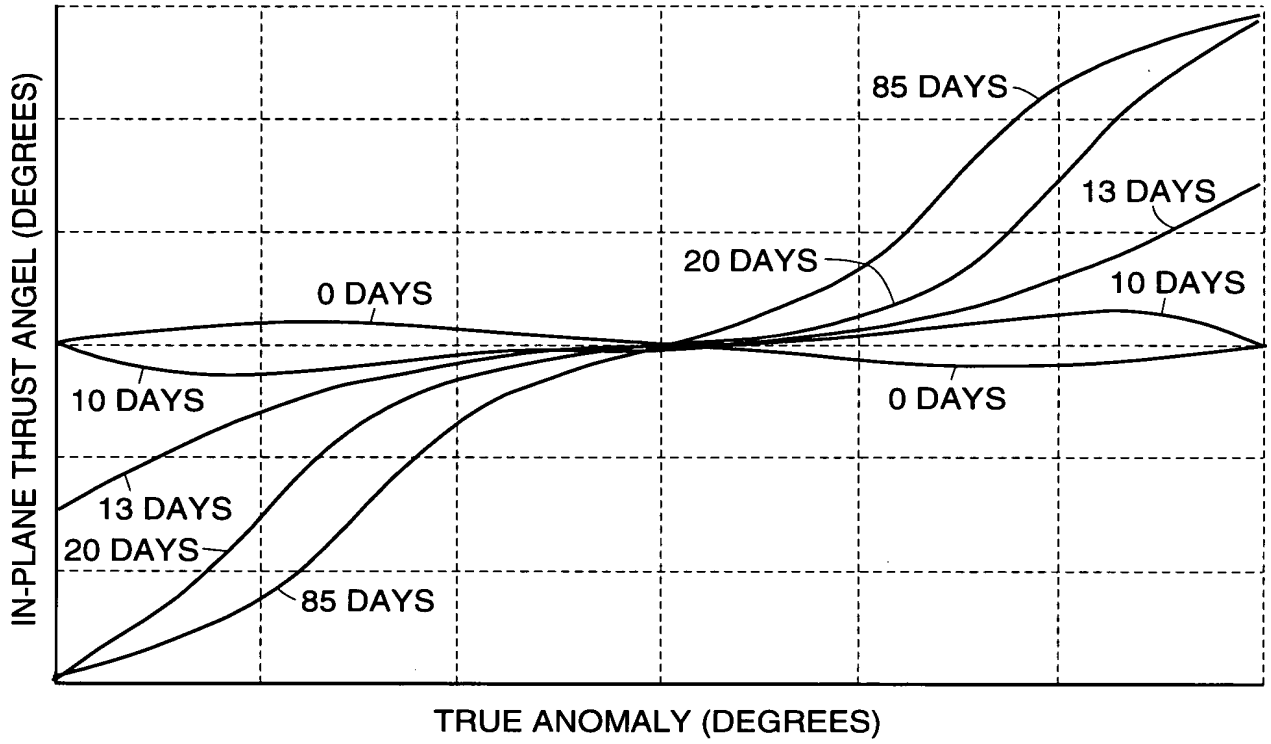
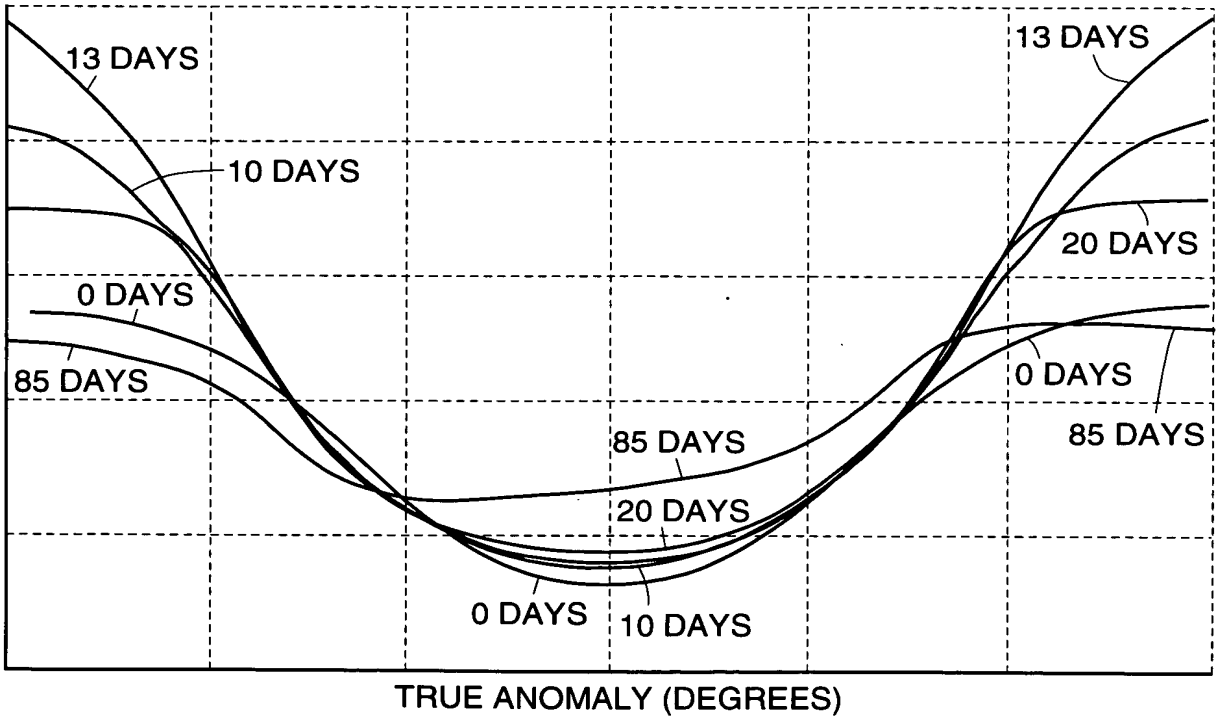


Fig. 9

TYPICAL OUT-OF-PLANE THRUSTING PROFILE



FIXED ATTITUDE - SELECTED FOR REQUIRED SOLAR ARRAY POWER - RESULTANT THRUST VECTOR NORMAL TO SOLAR ARRAY AXIS

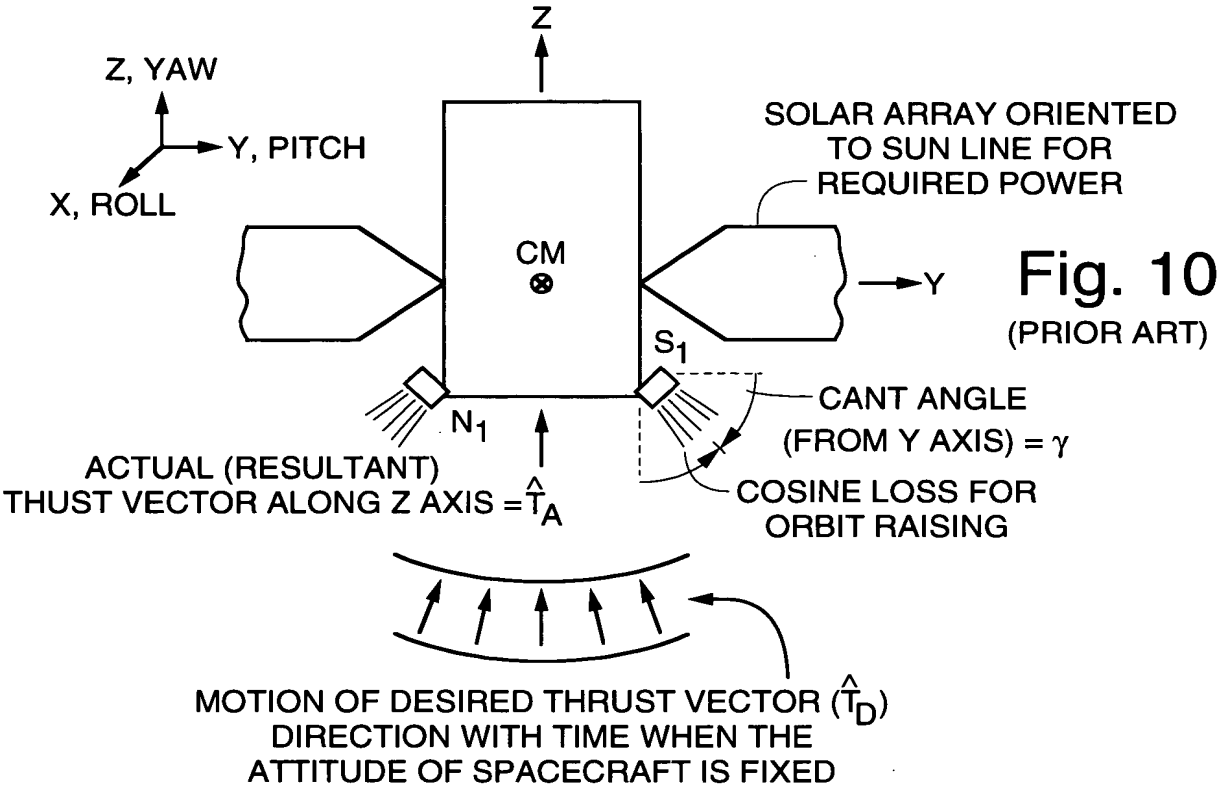
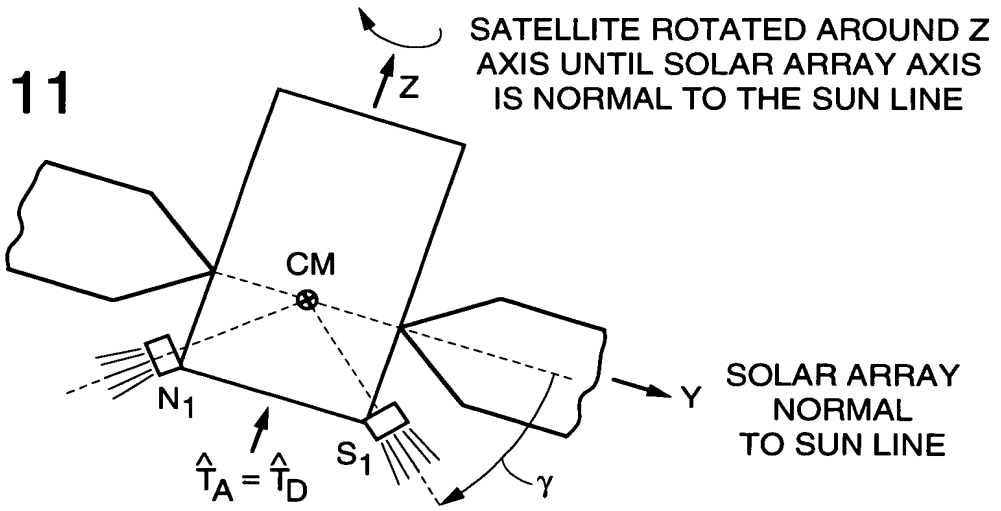


Fig. 10
(PRIOR ART)

SUN-ΔV STEERING - RESULTANT THRUST VECTOR NORMAL TO SOLAR ARRAY AXIS

Fig. 11



STEERING WHEN RESULTANT THRUST VECTOR IS NOT NORMAL TO SOLAR ARRAY AXIS

- SHOWN FOR THRUSTER(S) OPERATING ON ONE SIDE OF THE SATELLITE (SOUTH)

- RESULTANT THRUST VECTOR SHOWN COINCIDENT WITH DESIRED THRUST VECTOR

Fig. 12

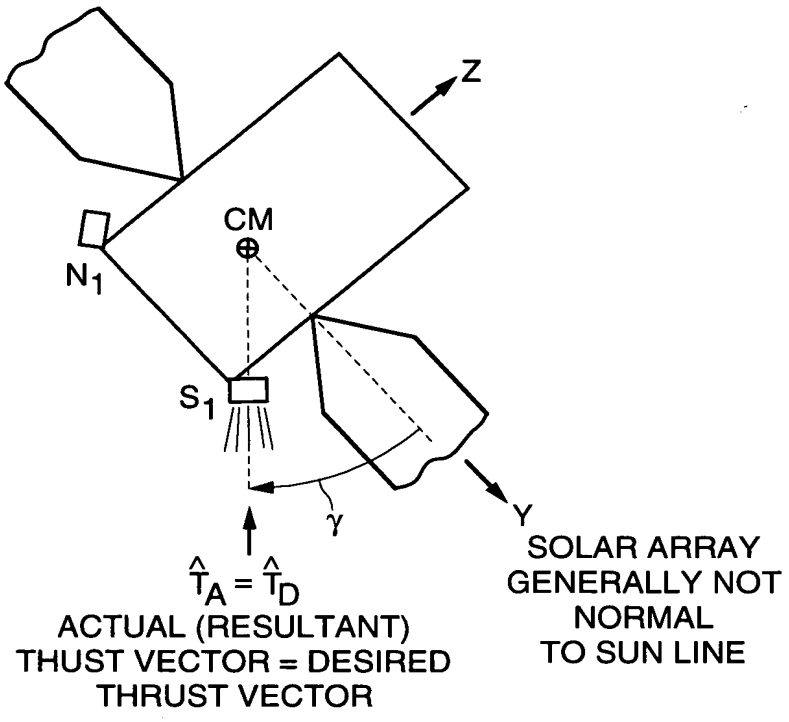
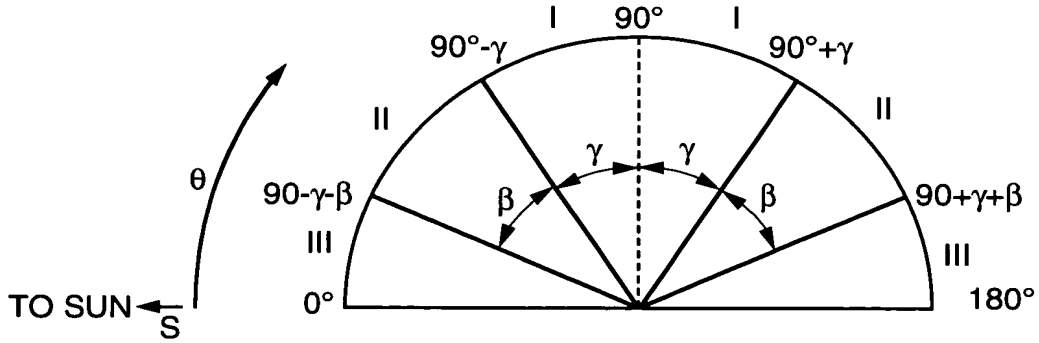


Fig. 13



DIRECTION OF THRUST VECTOR RELATIVE TO SUN VECTOR

EFFECT AT PERIGEE (REGION III)

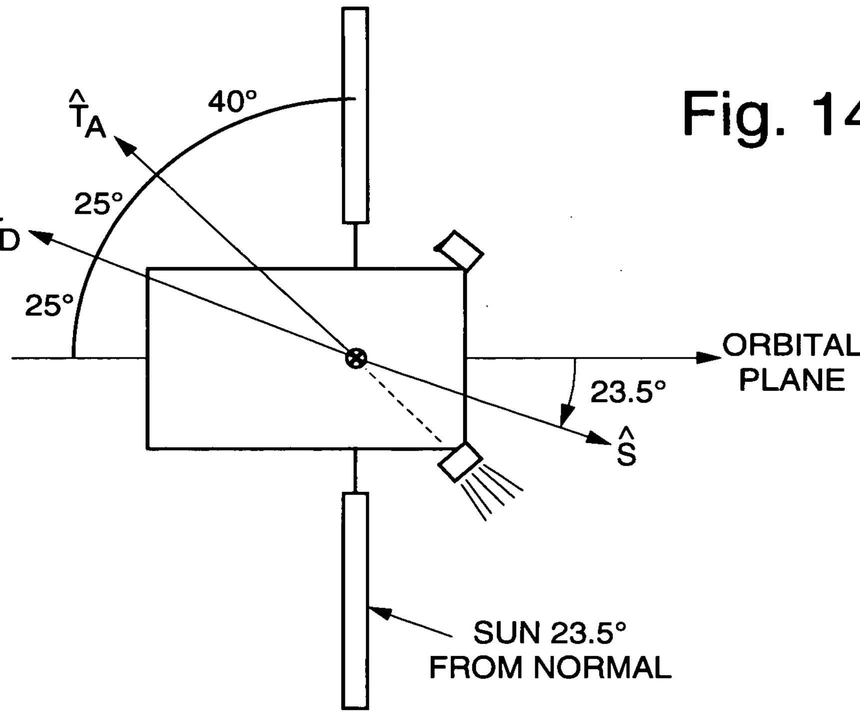


Fig. 14

EFFECT AT APOGEE (REGION II)

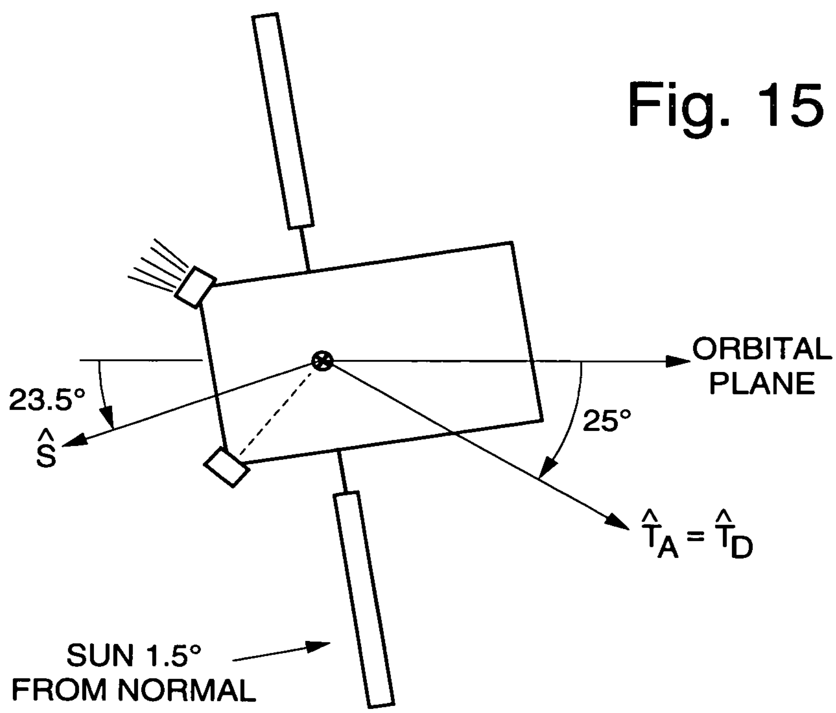


Fig. 15